

upon calcareous and silicious matters, and is one cause of the speedy decay of statuary and works of art. I am inclined to add sulphuretted hydrogen gas to this list of noxious substances, emanating from smoke, which produce effects upon the animal economy, analogous to those upon vegetable matters, which are objects of every-day observation.

Having thus alluded to the most palpable effects of smoke upon the animal economy, the next object of consideration is, as to how its formation may be prevented. I enter not here into the disputed point, as to whether coal smoke can be burnt after it has been actually formed, but only to the consideration of the means by which its distribution in the atmosphere may be prevented. That the amount of smoke may be much diminished in a common furnace, and a greater economy of fuel as a natural consequence be effected, there is no doubt. This may be accomplished by regulating the amount of fuel with greater care than is generally taken, and supplying it at more frequent intervals. It may be observed that the quantity of smoke emitted from furnace chimneys varies much with the state of the fire, being greatest when a mass of fresh fuel is thrown on, and least when the fire has burned clear, or the fuel is fully ignited. Attention to this circumstance on the part of the stoker will greatly diminish the nuisance, because if he throw on the fresh fuel in a thin layer, it will be the sooner perfectly ignited; and by laying it in the fore-part of the furnace, the dense smoke arising from it has to pass over that part of the fire which is in a state of more perfect combustion, and is thereby in a great measure consumed. This is the principle of many of the contrivances introduced or suggested as smoke-consuming furnaces, particularly those which have been designed on the additional plan for the right feeding of the fire, without much attention on the part of the stoker.

The means for obviating the smoke nuisance has attracted much attention from private individuals and public bodies, the former giving impulse to much scientific ingenuity, and the latter to active remonstrance and able suggestions. Little, however, has as yet been done in remedying the evil, which may be attributed to two causes,—the imperfection of all the plans in existence for remedying the evils to the advantage of the consumer, and the deficiency of legislation upon the subject. The progress of scientific ingenuity and mechanical improvement has, however, at last devised means for its accomplishment; and nothing now remains but for the Legislature to enforce enactments which will at once be beneficial to the consumer and advantageous in the preservation of public health. These circumstances I embodied in the following petition, which is now in course of active signature throughout the metropolis:—

*"To the Honourable the Commons of Great Britain, in Parliament assembled."*

"The Petition of the undersigned inhabitants of the Metropolis and its vicinity humbly sheweth,

"That your Petitioners are assured, from their own experience as well as observation, that much injury results to the health as well as to the property of the inhabitants of the metropolis, by the extensive diffusion of smoke in the atmosphere from the furnaces of the various manufactories in all its numerous populated districts. That the effects of this smoke are, in a medical point of view, very injurious, as, by the sooty particles depositing upon the skin, they interfere with its natural functional action, whilst their inhalation into the lungs is of the worst effect in producing pulmonary complaints, and further, in the aggravation of such and other constitutional disorders; that it is noxious to them, by soiling their clothes and injuring the furniture of their houses; that through its effects, the goods of many tradesmen, particularly those dealing in the lighter and more delicate fabrics of manufacture, are greatly depreciated in value and quality; and that its evil effects upon vegetation are most apparent by the recession of some of its most important products from those suburban districts in which they formerly grew and flourished.

"That your Petitioners are convinced that the extensive diffusion of smoke in the atmosphere, particularly in districts inhabited by the poorer classes of the community, is a

great bar to the improvement of their moral and social condition.

"That your Petitioners beg humbly to draw the attention of your Honourable House to the circumstance, that there exist plans by which this nuisance may be wholly prevented in manufactories and all other large establishments where furnaces are employed, and that to the great saving of the manufacturer. That in certain districts where these are employed, the effects are at once seen in contrast with the immense volumes of smoke given off by furnaces where no such means have been adopted; from which your Petitioners are convinced, that if some such plan were brought into general adoption, even as regards the smoke from manufactories alone, the atmosphere of London and its environs would be much clearer and more salutary than it is at present.

"That your Petitioners also humbly beg to draw the attention of your Honourable House to the present inefficient state of legislation on the subject as far as the metropolis is concerned. Your Petitioners would represent to your Honourable House, that whilst the local acts of Derby and other towns give a power of summary process where the evil is complained of and substantiated, the chances of obtaining redress are very difficult and remote in the metropolis, the only means of such redress being by action at common law, or by the act of George IV., cap. 41, commonly known as Michael Angelo Taylor's Act, which, however, only applies to nuisances from smoke in cases where steam-engines are employed, whilst, by the former, an indictment cannot be sustained after the nuisance has been in existence for a period of twenty years. Your Petitioners are therefore precluded from that prompt mode of relief, which, if provided and enforced, would, they are convinced, be of great benefit to the health and comforts of themselves and the inhabitants of the metropolis generally.

"Your Petitioners would further state to your Honourable House, their impression, that the present means of remedy have been inoperative, and no further or more stringent legislative measures have been enacted, from the circumstance that scientific ingenuity had not devised any plan by which the evils might be prevented. Your Petitioners, however, beg to assure your Honourable House that such means do now exist; and they approach your Honourable House with confidence, that whilst any legislative measures for the easy remedying the evil would be attended with great advantages to the interests of the manufacturer, in his saving of what is now a positive loss, to the deterioration to a great extent of the atmosphere.

"Your Petitioners further express their hope, that whilst the attention of Parliament is devoted to many plans for the improvement of the metropolis, this subject may attract its due attention, from the manifold evils which smoke inflicts, in impairing health, destroying or injuring vegetation, defacing public monuments and works of art, rendering property less valuable, and depreciating the qualities of furniture, soiling clothes and apparel, and rendering the poor less attentive to their personal appearance, and, as a consequence, to their social condition.

"Your Petitioners therefore humbly and earnestly appeal to your Honourable House to devise such means as in your wisdom you may think fit for remedying the evils of which they complain.

"And your Petitioners, as in duty bound, will ever pray."

That public attention is anxiously drawn to the subject, that they are prepared to adopt any practical suggestions or improvements, and to give support to any legislative measures that might be adopted; is evident from the number of inventions which within the last few years have been introduced, with the object of economizing fuel and preventing the formation of smoke. Unfortunately, this feeling has been but too little encouraged by corporate or public bodies. The corporation of London recently issued a report upon the subject, pointing out the best smoke-consuming plans then in operation, with recommendations for their adoption, on the grounds of economy to the consumer and as regarded the public health. Here, however, they suffered the matter to drop, without in any instance en-

forcing the statutes as by law provided. The Metropolitan Improvement Society (on whose committee rank some of the most intelligent and practical scientific men in the metropolis) have recently issued notices threatening to enforce the present laws in cases where their provisions are evaded, but they have not yet attempted to obtain a conviction, nor is it probable that any attempt will be successful at the suppression of the nuisance until fresh legislative measures are provided for the encouragement of scientific ingenuity, alike with the benefit of the public. Their exertions have been laudable in making this the first subject of their inquiry, and in their investigation of the most feasible plans for their abatement; and their having been satisfied that means for the total suppression of smoke do now exist, has led to the proposition for the active measures which it is now their intention to adopt.

Although many plans have been introduced and proved partially successful, for the suppression of the smoke nuisance, and that on the principles which I have previously alluded to, none have hitherto proved perfectly successful or such as to lead to their very extensive adoption. I have now, however, great pleasure in recommending to the notice of the commission a furnace recently invented by Mr. John Jukes, a description of which I enclose. In this, the perfect chemical combustion of the coal is effected by the mechanical arrangement of the furnace. That the former is the case, is shown in the entire absence of smoke from the chimneys of the furnaces under which it is employed, as it is entirely divested of the carbonaceous and bituminous particles, the diffusion of which in the atmosphere is the source of so much injury to health and vegetation. The details of this will, I have no doubt, attract the attention of the members of the commission, as connected with one of the most important objects of inquiry to which their attention can be directed.

I have previously alluded to the probable chemical composition of smoke, and the examination of the volatile products given off from the chimneys of the furnaces in which it is in operation, which leads me to some important conclusions as regards the difference between the smoke of common furnaces and the vapour given off in combustion from those just alluded to. Nothing is there proved to exist but carbonic acid, the natural and necessary product of the most complete combustion; nitrogen gas, essential from its separation from the air, the oxygen being required for the support of combustion; and sulphurous acid gas, the quantity of which depends upon the quality or nature of the coal employed. This I find to be greatly lessened in one of these furnaces, from the sulphur of the coal coming into more intimate combination with the iron and other metallic particles, more running down in a fluid state than is given off in a vaporized condition. Ammonia and the other ingredients which are chemical constituents of ordinary smoke are not to be found, though, perhaps, the most important distinction is in the total absence of the mechanical impurities, viz. the carbonaceous and bituminous particles constituting the *smuts* or *dirt* which so largely deposit upon furniture and clothing, impede the circulation and secretions, by fixing upon the skin; injure the system by their inhalation into the lungs; and in many other respects are annoying and injurious to the animal economy and the social and personal comforts of the community.

Without prejudging any of the other plans for effecting the desirable object of the prevention or formation of smoke, I can satisfactorily recommend to the notice of the commissioners the invention of Mr. Jukes, as one that effects in the most perfect manner the entire suppression of smoke from furnaces, with a most important equivalent result,—that of great economy to the manufacturer or consumer. In this invention, as far as smoke is concerned in the deterioration of public health, I am sure her Majesty's commissioners will find a valuable adjunct, and I cordially recommend it to their notice as one of the most important subjects connected with the wide range of investigation and inquiry which it is their design to undertake.

In the extensive range of chemical inquiry connected with public health, I would also suggest to the notice of her Majesty's commissioners the desirability of their concen-